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(71)Applicant : TOYOTA MOTOR CORP

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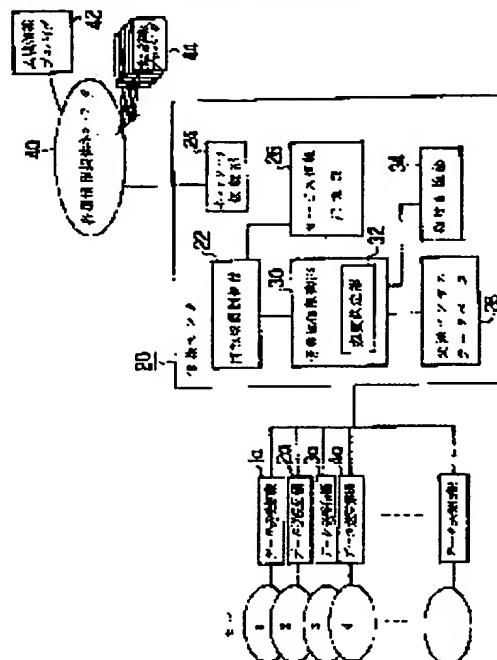
(72)Inventor : NOJIMA AKIHIKO

(54) VEHICLE INFORMATION SERVICE SYSTEM AND VEHICLE INFORMATION SERVICE METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide proper service information in response to their trip contents for a number of vehicles.

SOLUTION: Each data transmitter-receiver acts like a ground station and sends service information to a vehicle in a cell. An information acquisition section 22 of an information center 20 acquires two kinds of service information from an information service network 40, that is, broad area information and detailed information. A traffic census database 28 is a database of trip information of vehicles in each cell and the trip information includes a departure site and a destination of each trip. An information distribution control section 30 controls transmission frequency of the broad area information and detailed information, based on the trip information. For instance, the transmission frequency of the broad area information is set higher than that of detailed information in a cell where long distance trip takes place frequently.



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CLAIMS

[Claim(s)]

[Claim 1] An earth station means to be the system to offer information for cars which provides two or more cars with the service information used with a mounted terminal unit, to have a predetermined transmitting cel, and to transmit said service information to the car in the cel, An information acquisition means to acquire two or more kinds of service information which is the information on the range of a scale different, respectively as service information for making it transmit to said earth station means, A trip information acquisition means to acquire trip information including two or more origins and destinations of a trip of a car in said transmitting cel, The system to offer information for cars characterized by including the transmitting frequency control means which adjusts the transmitting frequency of two or more kinds which said earth station means transmits of said service information based on said trip information.

[Claim 2] It is the system to offer information for cars characterized by said transmitting frequency control means changing said transmitting frequency in a system according to claim 1 according to time amount based on time amount change of trip information.

[Claim 3] The system to offer information for cars characterized by including the field control means which changes the offer field of said service information by making two or more earth station means provide either of claims 1 or 2 with said service information on common contents further in the system of a publication based on said trip information.

[Claim 4] It is the system to offer information for cars characterized by adjusting said offer field according to this long-distance trip when there are many cars with which said field control means performs a long-distance trip in a system according to claim 3.

[Claim 5] The information offer approach for cars characterized by to transmit two or more kinds of the service information which is the information offer approaches for cars of providing two or more cars with the service information used with a mounted terminal unit, and is the information on the range of a scale which is different to the car in a predetermined transmitting cel, respectively by the transmitting frequency based on trip information including two or more origins and destinations of a trip of a car in said transmitting cel.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the system to offer information for cars, and the system which can offer the suitable information according to the contents of a trip of the car which receives information offer especially.

[0002]

[Description of the Prior Art] Conventionally, development of the system to offer information for cars with which an information centre offers various kinds of useful information to a car is furthered as so-called part of ITS (Intelligent Transport Systems). In one mode of such a system, the whole object domain of communications service is divided into plurality, and, thereby, two or more cels are set up. The earth station (1 or plurality) which takes charge of the cel is established in each cel. An earth station transmits information by broadcast etc. to the car in a cel. Here, the information with which a car is provided is hereafter called service information. Service information is the information about facilities, such as for example, map information, traffic information, and a restaurant.

[0003] For example, in JP,8-22246,A, an earth station transmits the map information on the fixed range as service information to the unspecified car in the information offer area (equivalent to a cel) of the earth station. The road map information on the fixed range offered is the road map information on the range which the average car in an information offer area needs.

[0004]

[Problem(s) to be Solved by the Invention] By the way, many cars exist in one cel and the trip which changes with cars is performed. A trip means that a car moves to other locations (destination) from a certain location (origin). In a cel, it can be said that the car which carries out a long-distance trip, and the car which carries out a short distance trip are intermingled. Conventionally, the uniform information on the fixed range is offered regardless of such a situation. Therefore, it was difficult for all cars to receive offer of the suitable service information according to their contents of a trip. For example, supposing the information for short distance trips is offered, a long-distance trip car cannot obtain useful information. It is meaningless even if it provides with a neighboring housing map the car which runs a highway. Conversely, it is also the same as when the information for long-distance trips is offered, and a short distance trip car cannot obtain useful information.

[0005] This invention is made in view of the above-mentioned technical problem, and the purpose is in offering the system to offer information for cars and the offer approach of offering the suitable service information according to the contents of a trip of each car to many cars.

[0006]

[Means for Solving the Problem] (1) An earth station means for the system to offer information for cars of this invention to be a system which provides two or more cars with the service information used with a mounted terminal unit, to have a predetermined transmitting cel, and to transmit said service information to the car in the cel. An information acquisition means to acquire two or more kinds of service information which is the information on the range of a scale different, respectively as service information for making it transmit to said earth station means. A trip information acquisition means to acquire trip information including two or more origins and destinations of a trip of a car in said transmitting cel, and the transmitting frequency control means which adjusts the transmitting frequency of two or more kinds which said earth station means transmits of said service information based on said trip information are included.

[0007] According to this invention, two or more kinds of service information which is the information on the range of a different scale as service information offered to a car is acquired. Thereby, the information suitable for each of two or more kinds of contents of a trip (for example, a long distance and short distance) can be offered. And the transmitting frequency of two or more kinds of this service information is adjusted based on trip information. For example, when there are many long-distance trip cars, the transmitting frequency of the broader-based information on a big scale is set up greatly. Moreover, for example, when there are many short distance trip cars conversely, the transmitting frequency of the detailed information of the narrow range is set up greatly. Thus, according to the situation what kind of contents of a trip there are many cars with, the transmitting frequency of the high service information on needs can be enlarged. As mentioned above, according to this invention, the suitable service information suitable for the contents of a trip can be offered to many cars by transmitting two or more kinds of service information, and adjusting the transmitting frequency based on trip information.

[0008] Preferably, said transmitting frequency control means changes said transmitting frequency according to time

amount based on time amount change of trip information. According to this mode, it can respond to fluctuation of the contents of a trip by the time zone of a day. For example, the transmitting frequency of the broader-based information for long distances is greatly set to a time zone with many long-distance trip cars.

[0009] (2) The system to offer information [like] for cars includes further the field control means which changes the offer field of said service information 1 voice by [with desirable this invention] making said service information on common contents transmit to two or more earth station means based on said trip information.

[0010] According to this mode, the configuration and size of an offer field of a certain service information can be adjusted by changing suitably the number and array of a transmitting cel which offer common contents information especially by offering the service information on common contents in two or more transmitting cels. For example, although the transmitting frequency of the broader-based service information on each cel is greatly set up as ****

(1) explained when there are many cars which perform a long-distance trip, in this mode, the field (assembly of a cel) which offers that broader-based service information is further adjusted suitably according to a long-distance trip. The zone control using such common information can perform information gathering and transmission efficiently.

[0011] (3) Moreover, the information offer approach for cars of this invention is an approach of providing two or more cars with the service information used with a mounted terminal unit, is the transmitting frequency based on trip information including two or more origins and destinations of a trip of a car in said transmitting cel, and transmits two or more kinds of service information which is the information on the range of a scale which is different to the car in a predetermined transmitting cel, respectively. According to this mode, the above-mentioned effectiveness of this invention is realized in the form of an approach.

[0012]

[Embodiment of the Invention] Hereafter, the gestalt (henceforth an operation gestalt) of suitable operation of this invention is explained with reference to a drawing. Drawing 1 shows typically the area which can receive information offer with the system to offer information of this operation gestalt. Many circular cels 1 and 2 and ... adjoin like illustration, and it is prepared. The size of each cel is set as the radius of about 5-10km. And the earth station is established in each cel and this earth station transmits service information to the car in a cel. As mentioned above, service information is for example, map information, traffic information, and facility information (a restaurant, a store, a tourist resort, etc.). An earth station performs information transmission on a car using FM multiplex, beacon equipment, and which cellular communication link technique. Since one cel is covered, two or more earth stations may be prepared (when applying beacon equipment etc.). Furthermore, in the area of drawing 1, the intercity expressway AB (City A and City B are connected) passes. Cels 1-8 exist along a highway, and cels 11-14 exist in the location distant from the highway.

[0013] Drawing 2 shows the information offer structure of a system of this operation gestalt. cels 1, 2, and 3 ... the data transmitter-receivers 1a, 2a, and 3a as an earth station ... is prepared. A data transmitter-receiver transmits the service information sent from the information centre 20 to the car in a cel. Moreover, a data transmitter-receiver receives the data sent from the car in a cel, and sends them to an information centre 20.

[0014] Drawing 3 shows the configuration of the terminal unit 50 carried in the car. Navigation ECU 52 is controlling the whole terminal. GPS equipment 54 detects the current position and sends it to navigation ECU 52. A user inputs the destination of a trip using an input unit 56. Navigation ECU 52 sets a its present location as an origin, and computes the optimal path from a its present location to the destination using the map information in the map information storage section 62. In path computation, processing according to the well-known approaches, such as a Dijkstra method, is performed. Navigation ECU 52 performs path guidance using a display 58 or a loudspeaker 60 based on a setting path.

[0015] Furthermore, in drawing 3, the receipt information storage section 64 and a communication circuit 66 are connected to navigation ECU 52. The communication circuit 66 supports the communication link technique, such as FM multiplex, cellular one, and beacon equipment, as mentioned above. It is received by the communication circuit 66 and the service information sent from an earth station is stored in the receipt information storage section 64. Navigation ECU 52 performs various kinds of processings in which service information was used effectively. For example, a user is shown service information using a display 58 or a loudspeaker 60. Moreover, for example, with reference to service information, path computation etc. is performed. Moreover, navigation ECU 52 sends data to an earth station using a communication circuit 66. With this operation gestalt, the origin of a trip and the destination, and the trip information that includes current time further are transmitted in the case of routing processing so that it may mention later.

[0016] In return and an information centre 20, the information acquisition control section 22 functions on drawing 2 as an information acquisition means of this invention, and broader-based information and detailed information are acquired as two or more kinds of service information. The information acquisition control section 22 is connected with the various information offer networks 40 through the network connection section 24. A network 40 is provided with broader-based information by the broader-based information provider 42, and is provided with detailed information by the local information provider 44. Broader-based information is the information on the large range, and when performing a long-distance trip, it is useful. Broader-based information is the macroscopic traffic information about the big field containing many cels, and is the traffic information on the distant place beyond the service field of for example, this system (traffic information about a highway etc.). On the other hand, detailed information is the information on the narrow range, and when performing a short distance trip like migration within a cel, it is useful. For example, the local information provider 44 is formed for every cel, and the every place region

information provider 44 offers the traffic information in its cel. The information acquisition control section 22 stores in the service information storage section 26 the broader-based information and detailed information which came to hand from the network.

[0017] Moreover, the transportation census database 28 is formed in the information centre 20. The transportation census database 28 has memorized the trip information on the car in a cel for every cel. Trip information includes the time amount to which the origin (O) of a trip, the destination (D), and a trip are carried out. Statistics of the trip information on many cars in a cel is searched for, and the transportation census database 28 memorizes. Furthermore, OD distribution data (refer to drawing 4 and drawing 5) created by totaling trip information are contained in this database. OD distribution data of drawing 4 express distribution of OD (an origin and destination) of the car in each cel according to a time zone as follows.

[0018] For example, the cel 1 includes Highway AB (refer to drawing 1). Therefore, there are many long-distance trip cars which run a highway in a midnight time zone, and there are few short distance trip cars which run a general path. On the other hand, the cars which run a nearby general path increase in number more than the car which runs a highway in a commuting time band.

[0019] OD distribution data of drawing 4 are reflecting such a traffic situation. In a cel 1, 50% or more of car of all cars performs the trip of the origin = cel 1 and the destination = cel 8 in the time zone at 0:00- 6:00. Moreover, 20 - 30% of car performs the trip (trip in a cel) of the origin = cel 1 and the destination = cel 1 on the band between coincidence. On the other hand, the time zone at 6:00- 8:00 has many cars which perform the short-distance trip in a cel, and they exceed 50% in it. In addition, in drawing 4 , the car which performs a further long-distance trip across the section of a cel 1 and a cel 8 is also counted as a car which performs the trip of the section of a cel 1 and a cel 8.

[0020] OD distribution data of drawing 5 are created based on the data of drawing 4 , and express distribution of the trip die length of midnight and commuting time about the car in a cel 1. It corresponds to the traffic situation mentioned above, midnight has many long-distance trip cars, and a commuting time band has many short distance trip cars.

[0021] On the other hand, in drawing 4 , there are many cars with which a midnight time zone (0:00- 6:00) and a commuting time band (6:00- 8:00) perform a short distance trip about a cel 11. Since the cel 11 is distant from Highway AB, in a midnight time zone, the ratio of a long-distance trip does not become high.

[0022] other cels 2 and 3 which exist along a highway about other cels — if attached to ..., the same OD distribution as a cel 1 is seen. moreover, the cels 12 and 13 which are distant from a highway — about ..., the same OD distribution as a cel 11 is seen.

[0023] The above-mentioned OD distribution changes also with a day of the week or dates, and differs by any of a holiday and a public holiday they are a weekday. Moreover, OD distribution differs, also when events (a trade fair, a sport event, a concert, etc.) are held in the cel and nearby cel. Then, the trip information also containing various kinds of above elements is collected, and OD distribution is created after classifying trip information in consideration of these elements.

[0024] Moreover, the transportation census database 28 is a database made based on the result of the past statistics as mentioned above. With this operation gestalt, reexamination of a database is performed using the trip information sent from the car in a cel. That is, a mounted terminal unit (drawing 3) uplinks an origin and the destination to an information centre 20, when routing is performed. An origin and the destination are expressed by the node of the map information on link data format. Moreover, if a car performs a trip also when routing is not performed, it will be at the termination time of a trip and the origin and arrival ground of a trip will be uplinked. Thus, the trip information acquired from the car it is actually running is totaled as shown in drawing 6 . And the newest data are prepared for the transportation census database 28 by the reexamination processing based on a total result.

[0025] Furthermore, the information distribution control section 30 is formed in the information centre 20. On the whole, the information distribution control section 30 is controlling distribution of the service information on a cel. That is, as the information distribution control section 30 is the following, it decides what kind of information should be offered in which cel, and sends the information which should be offered to an every place top station.

[0026] The information distribution control section 30 reads the service information (what was acquired from the network) stored in the service information storage section 26, processes the read service information and prepares the service information for offer. Under the present circumstances, two kinds of service information on the detailed information suitable for a short distance trip and the broader-based information suitable for a long-distance trip is prepared for every cel. Detailed information and broader-based information are sent to the data transmitter-receivers 1a and 2a and ... which were prepared in the corresponding cel.

[0027] Moreover, the frequency decision section 32 is formed in the information distribution control section 30. The frequency decision section 32 determines the transmitting frequency of the above-mentioned detailed information and broader-based information based on OD distribution data with reference to OD distribution data in the transportation census database 28. Transmitting frequency is determined for every cel. For example, in the example of drawing 5 , there are many cars which perform a long-distance trip in a midnight time zone in a cel 1. Then, the transmitting frequency of broader-based information is set up to 90%, and the transmitting frequency of detailed information is set up to 10%. Moreover, there are many cars which perform a short distance trip on a morning commuting time band in a cel 1. Then, in this time zone, the transmitting frequency of detailed information is set up to 90%, and the transmitting frequency of broader-based information is set up to 10%. Transmitting frequency is set

up for every day of the week (every [or] date) and every time zone. A holiday and a public holiday are specially treated as a day, and transmitting frequency is set up separately. One day [of an event] is similarly processed as a day specially. Thus, the set-up transmitting frequency is memorized by the frequency storage section 34.

[0028] The information distribution control section 30 reads the transmitting frequency corresponding to a current day of the week and a current time zone from the frequency storage section 34. As mentioned above, transmitting frequency is set up for every cel. the data transmitter-receivers 1a and 2a of a cel with which transmitting frequency corresponds — it is sent to ... A transmitter-receiver is transmitted to the car in a cel according to the transmitting frequency where detailed information and broader-based information were sent from the information distribution control section 30.

[0029] Drawing 7 shows the situation of adjustment of the transmitting frequency of detailed information and broader-based information. In drawing 7, A1 – A9 show detailed information, and B1–B9 show broader-based information. In sequence like illustration, sequential transmission of detailed information and the broader-based information is carried out. In the example of drawing 7, both the transmitting frequency of detailed information A and the broader-based information B is 50% from 1:00 before 4:00 (1:1). The transmitting frequency of detailed information A and the broader-based information B is 75% and 25% from 4:00 before 10:00, respectively (3:1).

[0030] With this operation gestalt, the transmitting frequency of detailed information and broader-based information is adjusted according to OD distribution as mentioned above (adjustable control of the transmitting interval is carried out). OD distribution is created from trip information. Therefore, with this operation gestalt, control of transmitting frequency based on trip information is performed.

[0031] Moreover, with this operation gestalt, the contents of broader-based information are adjusted by the information distribution control section 30 based on trip information. Here, the direction of the trip of the long-distance trip car in a cel is taken into consideration. If drawing 1 is referred to, the car in a cel 1 will perform the long-distance trip along Highway AB in many cases. OD distribution data of drawing 4 also show this phenomenon. Then, the long information about a field prolonged in the direction along Highway AB is prepared as broader-based information, and is offered. Moreover, it is also suitable to offer the information on the distant place along Highway AB.

[0032] About broader-based information, the information distribution control section 30 controls information distribution by this operation gestalt further again so that the information on common contents (these contents) is offered within two or more cels. For example, cels 1–8 exist along Highway AB. Then, the broader-based information related to Highway AB is prepared so that it can use in common in cels 1–8. This broader-based information is the road map of a highway and a perimeter, and traffic congestion information and service area information. Such broader-based information is sent to cels 1–8 from an information centre 20. On the other hand, cels 11–14 are distant from Highway AB. Then, a highway is made and provided with the broader-based information which is not related so that it can use in common in these cels. Thus, informational collection and informational offer are efficiently performed by providing two or more cels with common broader-based information.

[0033] Here, with this operation gestalt, the field which consists of a cel group which sends common broader-based information is called information offer field in the above-mentioned processing. Determining based on the following criteria is suitable for an information offer field. The trip which has an origin and a destination in an information offer field is defined as the trip in a field. And the cel to communalize is chosen so that the ratio (trip ratio in a field) of the number of the trip cars in a field to the total number of cars in a field may turn into a predetermined ratio (for example, 50% – 70%). For example, in the above-mentioned example, the cels 1–8 along a highway are chosen as a cel for communalization, and, thereby, the ratio of the trip in a field becomes a suitable value. The configuration and size of an information offer field are suitably changed according to a day of the week, a time zone, etc. on the basis of the trip ratio in a field. Thus, by being based on the trip ratio in a field, two or more cels which offer common broader-based information can be defined exactly.

[0034] In addition, the example which sets an information offer field as along a highway was taken up here. Various field setup on the basis of the trip ratio in a field, such as setting an information offer field as others, so that the interchange and the event hall of a highway may be connected, is possible.

[0035] Moreover, with this operation gestalt, the amount of data of service information (detailed information and broader-based information) which transmits is adjusted based on trip information. As mentioned above, the information distribution control section 30 processes the data in the service information storage section 26, and prepares the data for transmission for every cel. Under the present circumstances, the average trip time amount in a current day of the week and a current time zone is referred to about each cel. Average trip time amount is found from trip information or OD distribution data. And the amount of data is adjusted so that transmission may finish with several [1/] of the time amount (for example, time amount not more than 20% or it) of average trip time amount. It is also suitable to perform the choice which took an informational significance into consideration for amount-of-data adjustment. A car receives and uses into a trip the service information on the amount of data adjusted as mentioned above.

[0036] In the above-mentioned amount-of-data adjustment processing, it is also suitable to find the average trip time amount of a long-distance trip and a short distance trip, and to adjust separately the amount of data of detailed information and broader-based information. In this case, the amount of data of broader-based information may exceed the amount of data which can receive while increasing compared with detailed information, consequently running one cel. Even in this case, since common information is offered in two or more cels as mentioned above, a car should just receive data, while running two or more cels. Thus, according to this operation

gestalt, it also becomes possible to offer a lot of data. In addition, when information offer conditions, such as a frequency, differ in the adjoining cel, a car is provided with the information about this condition with service information.

[0037] In the above, the suitable operation gestalt of this invention was explained. According to this operation gestalt, based on trip information, the transmitting frequency of broader-based information and detailed information is controlled for every cel. The transmitting frequency of broader-based information is greatly set to a main time zone for a long-distance trip, and the transmitting frequency of detailed information is greatly set to a main time zone for a short distance trip. Therefore, the transmitting frequency of the high information on needs can be enlarged. Moreover, there is no futility of transmitting the low information on needs by high frequency. Thus, the suitable service information suitable for the contents of a trip can be offered to many cars.

[0038] Moreover, according to this operation gestalt, informational collection and informational offer can be efficiently performed exactly as mentioned above by offering the broader-based information on common contents in two or more cels on the basis of the trip ratio in a field.

[0039] In addition, with this operation gestalt, the trip information acquired according to the past statistics is used. On the other hand, the trip information on the car in a cel may be collected on real time, and processing based on this real-time information may be performed. Real time trip information is acquired by the communication link (up link) with a car. Moreover, it is detectable using real-time information that the flow of the traffic corresponding to a special event has occurred. For example, while the car which goes to a certain location is focusing, event generating can be known and information offer in consideration of an event can be performed.

[0040] Next, the example of concrete application of this invention is explained. Suppose that this invention was applied to FM multiplex network which covers the whole country. each FM station — one's transmitting area (cel) — **** — it is. Since a weekday has many trips in a cel, the transmitting frequency of the information in a cel (event information etc.) is set up greatly. Moreover, the newest map data of the wide area in a northeast area are mainly distributed to the field which met Tohoku Expressway a holiday and over a long period of time in the season of consecutive holidays. By repeating data common to two or more FM stations along Tohoku Expressway, and transmitting, a lot of information offer also becomes possible.

[0041] Moreover, it is the communication network constituted by many comparatively small cels, and suppose that this invention was applied to a communication network which covers a certain city. In the cel which exists along with highways (trunk road etc.), the traffic information on a wide area is mainly offered. In the cel of the area which left the highway, nearby detailed information is mainly distributed. Under the present circumstances, the purpose of a trip can also sometimes be presumed from trip information. For example, the time zone of an afternoon understands that there are many trips for housewifely shopping in a residential street. So, in this time zone, shopping center information is offered as detailed information. Thus, still more exact information can be offered by taking the trip purpose into consideration based on trip information. Moreover, in this case, it is thought suitable in a midnight time zone also near a highway or in the location distant from the highway to offer broader-based information.

[0042] Moreover, suppose that beacon equipment (partial communication device) is formed in a certain road. In this example, the information which beacon equipment offers is changed by the time zone. For example, a commuting time band sets up greatly the transmitting frequency of the delay information on a wide area, or parking lot information. The transmitting frequency of the information on the restaurant which exists along the road in which beacon equipment is installed is greatly set to the time zone of a lunch break.

[0043] Thus, the system to offer information of this invention is suitably realizable in a communication network with the cel of various kinds of magnitude.

[Translation done.]